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Prevalence of Sun Protection Use and Sunburn and Association of Demographic and Behavioral Characteristics With Sunburn Among US Adults

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Abstract

IMPORTANCE—Monitoring sun protection and sunburn over time at the population level can provide valuable information about progress toward skin cancer prevention goals and inform future intervention efforts.

OBJECTIVE—To examine the prevalence of sun protection use (shade, sunscreen, and clothing) and sunburn and the association between sunburn and individual characteristics and health behaviors in the US population.

DESIGN, SETTING, AND PARTICIPANTS—In this cross-sectional study using a nationally representative sample of 31 162 US adults from the 2015 National Health Interview Survey—Cancer Control Supplement, household interviews of civilian, noninstitutionalized US adults were conducted throughout 2015 in person and completed on the telephone when necessary. Data analysis was performed from August 16, 2016, to September 6, 2017.

MAIN OUTCOMES AND MEASURES—The prevalence of sunburn and use of sun protection and their association with demographic characteristics, sun sensitivity, and health-related behaviors and conditions using multivariable logistic regression modeling.

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Study concept and design: Holman, Guy, Watson, Hartman, Perna.

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RESULTS—A total of 31 162 respondents (mean [SD] age, 47.0 [0.36] years; 13 932 male [44.7%] and 17 230 female [55.3%]) were included in the analyses, with 34.2% experiencing sunburn in 2015. Sunburn prevalence was higher among younger age groups (51.2% in adults 18–29 years old; 95%CI, 48.8%–53.7%), non-Hispanic white individuals (42.5%; 95%CI, 41.2%–43.9%), and those with sun-sensitive skin (50.2%). However, sunburn was also prevalent among black (13.2%; 95%CI, 11.6%–15.1%) and Hispanic (29.7%; 95%CI, 27.6%–31.9%) individuals, demographic groups that are often considered to be at low risk of skin cancer. The most frequent sun protection behaviors were staying in the shade (37.1%; 95%CI, 36.3%–38.0%) and using sunscreen (31.5%; 95%CI, 30.7%–32.3%) followed by wearing long clothing to the ankles (28.4%; 95%CI, 27.6–29.1). Sun avoidance behaviors (seeking shade and not going in the sun) were significantly (39.5% vs 35.1%; $P < .001$) associated with a lower prevalence of sunburn. Those who used self-applied sunless tanning products (45.0% of users vs 36.1% of nonusers; $P < .001$), those who engaged in aerobic activity (37.9% of aerobic exercisers vs 32.8% of non-aerobic exercisers; $P < .001$), binge drinkers (45.1% of binge drinkers vs 35.0% of non-binge drinkers; $P < .001$), and overweight or obese individuals (37.9% of overweight or obese individuals vs 34.4% of non-overweight or obese individuals; $P < .001$) were more likely to experience sunburn compared with the respective comparison groups.

CONCLUSIONS AND RELEVANCE—Sun sensitivity was significantly associated with a higher sunburn prevalence, independent of race/ethnicity, suggesting a need to consider sun sensitivity when identifying target demographic groups for sun safety interventions. Efforts to improve vigilance and consistency with use of sun protection are needed. In addition, those who engage in physical activity, use sunless tanners, or use sunscreen for tanning purposes may require additional intervention strategies to address the unique barriers they face in staying adequately protected.

Each year, nearly 5 million people are treated for skin cancer in the United States at a cost of approximately \$8.1 billion,¹ and more than 9000 people in the United States die of melanoma.² In July 2014, the US Surgeon General released the *Call to Action to Prevent Skin Cancer* to increase awareness about and call for actions to reduce skin cancer risk at a population level.³ Most skin cancer cases are caused at least in part by overexposure to UV radiation from the sun or indoor tanning devices.⁴ Recommendations to reduce UV radiation exposure include using sun protection when outdoors and avoiding indoor tanning.³ Tracking these behaviors at the population level can provide information about progress toward prevention goals. In addition, sunburn is often used as a biomarker of skin cancer risk, reflecting the skin's sun sensitivity and intensity of UV radiation exposure, and research indicates that sunburn at any age increases skin cancer risk.⁵ The Healthy People 2020 objectives include increasing the proportion of adults 18 years and older who follow protective measures that may reduce the risk of skin cancer (objective C-20.6) and reducing the proportion who report sunburn (objective C-20.2).⁶ In this report, we provide the latest national estimates of sunburn and use of sun protection among US adults using the 2015 National Health Interview Survey (NHIS)– Cancer Control Supplement data.⁷ We also describe associations among sunburn, sun protection, and demographic and behavioral characteristics.

Methods

The NHIS is an annual, cross-sectional household interview survey of a nationally representative sample of the US noninstitutionalized civilian population that collects demographic and health-related information. Sampling and interviewing are continuous throughout each year. Interviews are conducted in person, with follow-up by telephone when needed. Information is collected about the household and each household member. One adult 18 years or older in each family is randomly selected for additional detailed questions. More information about the sample design and data collection procedures is available online.⁷ This study was exempt from review by the Centers for Disease Control and Prevention Human Subject Institutional Review Board because we used existing publicly available deidentified data.

In 2015, the Cancer Control Supplement was included in the sample adult section of the NHIS. After the family interview, one adult was randomly selected from each family for additional questions. A total of 33 672 adults were interviewed for the sample adult section, with a final, unconditional response rate of 55.2%.⁷ Our analyses included 31 162 respondents after excluding adults with a personal history of melanoma and those with unknown or missing responses to questions about sun protection or sunburn. Data were collected from throughout 2015. Data analysis was performed from August 16, 2016, to September 6, 2017.

Variables of Interest

Sun protection and sunburn were our main outcomes of interest. We examined the percentage of respondents who reported engaging in each of 5 sun protection behaviors (staying in the shade, wearing a wide-brimmed hat, wearing a long-sleeved shirt, wearing pants or other clothing that reaches the ankles, and using sunscreen with a sun protection factor ≥ 15) always or most of the time (hereinafter, regular use). A small percentage of individuals responded to the sun protection questions by saying that they “don’t go out in the sun.” This response option was not explicitly provided to respondents but was volunteered by some and was coded as a third category (ie, final categories were yes, no, or don’t go in the sun). We also created a dichotomous sun avoidance variable to capture those who regularly used shade or did not go in the sun and a dichotomous protective clothing variable to capture those who regularly used at least one form of protective clothing.

To assess sunburn, respondents were asked, “During the past 12 months, how many times have you had a sunburn?” We recoded the responses into a dichotomous variable (0 vs ≥ 1 sunburns) and an ordinal variable (0, 1, 2, 3, or ≥ 4 sunburns).

We included the following demographic characteristics: sex, age, race/ethnicity, marital status, sexual orientation, educational level, health insurance status, US region, and foreign-born status. We also included 2 measures of sun sensitivity similar to measures used in previous research.^{8,9} The first question asked what would happen to the respondent’s skin if, after several months of not being in the sun, the individual went out in the sun for an hour without sunscreen, a hat, or protective clothing (short exposure). The second question asked the respondent what would happen to their skin after being out in the sun repeatedly, such as

every day for 2 weeks, without sunscreen, a hat, or protective clothing (repeated exposure). Sensitivity to repeated sun exposure was included as a covariate in the multivariable logistic regression models. Sensitivity to short sun exposure was used to identify and limit some analyses to individuals who experience sunburn after 1 hour unprotected in the sun (hereinafter, sun-sensitive individuals). In addition, we included the following behaviors and health conditions: indoor tanning device use, sunburn from indoor tanning device use in the past 12 months, use of sunless tanning products (products that provide a tanned appearance without exposure to UV radiation), receipt of a skin examination, aerobic activity, binge drinking in the past 30 days, smoking status, being overweight or obese, family history of melanoma, and personal history of a cancer diagnosis.

Statistical Analysis

We calculated the percentage of adults engaging in each individual sun protection behavior always or most of the time, reporting sun avoidance, and using protective clothing overall by sex and among sun-sensitive individuals. We used unadjusted and adjusted analyses to estimate the percentage of adults who experienced sunburn in the past 12 months by demographic characteristics, health behaviors, and health conditions overall and among sun-sensitive individuals. We generated adjusted prevalence estimates (predictive margins) for sunburn using multivariable logistic regression models.¹⁰ Differences among the categories within a variable were assessed with linear contrasts. In addition, we estimated the percentage of individuals who tanned indoors who experienced at least 1 sunburn from indoor tanning in the past 12 months.

We used SAS-callable SUDAAN, version 11.0 (Research Triangle Institute) for the analyses and used the stratum and primary sampling unit variables provided with the NHIS data file to account for the complex survey design. The Wald χ^2 test was used to calculate 2-sided *P* values. We considered statistical tests with *P* < .05 to be statistically significant.

Results

A total of 31 162 respondents (mean [SD] age, 47.0 [0.36] years; 13 932 male [44.7%] and 17 230 female [55.3%]) were included in the analyses. The most frequently used sun protection behaviors among US adults were staying in the shade (37.1%) and using sunscreen (31.5%), followed by wearing long clothing to the ankles (28.4%) (Table 1). Regular use of long-sleeved shirts (12.3%) and wide-brimmed hats (14.2%) was less prevalent. Shade and sunscreen use were also the most frequently used protective behaviors among women (43.1% used shade and 40.2% used sunscreen) and among sun-sensitive individuals (41.1% used shade and 42.9% used sunscreen). Wearing long clothing to the ankles (34.3%) and shade use (30.7%) were the most prevalent among men. Within the 3 sun protection strategy categories (sun avoidance, protective clothing, and sunscreen), sun avoidance was the most prevalent among women (49.3%) and protective clothing was the most prevalent among men (43.8%). Sunscreen use (42.9%) and sun avoidance (42.3%) were the most prevalent strategies among sun-sensitive individuals.

A total of 34.2% of adults experienced sunburn in 2015, with 16.3% experiencing 1 sunburn, 9.9% experiencing 2 sunburns, 3.4% experiencing 3 sunburns, and 4.6% experiencing 4 or

more sunburns (Table 1). The distribution was similar among men and women. Among sun-sensitive individuals, 50.2% experienced sunburn. Sunburn decreased with increasing age (51.2% of adults 18–29 years old [95% CI, 48.8%–53.7%] vs 14.8% of adults ≥66 years old [95% CI, 13.2%–16.5%]; $P < .001$) and varied across racial/ethnic groups, with non-Hispanic white individuals (42.5%; 95% CI, 41.2%–43.9%; $P < .001$) being more likely to experience sunburn compared with other racial/ethnic groups (Table 2). Those with skin that tended to burn after repeated sun exposure were more likely to become sunburned compared with those of other skin types (43.5% of adults with skin that tends to burn [95% CI, 41.6%–45.4%] vs adults who develop a mild [35.4%; 95% CI, 34.1%–37.6%], moderate [36.1%; 95% CI, 34.7%–37.6%], or very dark [33.2%; 95% CI, 31.0%–35.5%] tan). Adults born in the United States were more likely to experience sunburn (38.2%) compared with those who had resided in the United States for less than 10 years (22.8%; $P < .001$) and foreign-born individuals who had resided in the United States for 10 or more years (29.6%; $P < .001$). These patterns were similar when limiting the analyses to sun-sensitive individuals.

Several behaviors were significantly associated with sunburn, including use of self-applied sunless tanning products (45.0% among users vs 36.1% among nonusers; $P < .001$), aerobic activity (37.9% among those who engaged in aerobic activity vs 32.8% among those who did not; $P < .001$), binge drinking in the past 30 days (45.1% among binge drinkers vs 35.0% among those who did not binge drink; $P < .001$), and overweight or obesity (37.9% among those who were overweight or obese vs 34.4% among those who were not; $P < .001$). We observed these same patterns when we limited the analyses to sun-sensitive individuals.

Adults who regularly used sun avoidance strategies were less likely to experience sunburn (34.7%) compared with those who did not regularly use sun avoidance strategies (37.7%; $P < .001$), but the absolute difference between the groups was small. The same pattern was observed when the analyses were limited to sun-sensitive individuals. Regular sunscreen users were more likely to experience sunburn (39.5%) compared with those who did not regularly use sunscreen (35.1%; $P < .001$), with a smaller absolute difference between groups when limited to sun-sensitive individuals (52.2% vs 50.7%; $P = .02$). Wearing protective clothing (36.3%; 95% CI, 34.8%–37.8%; $P = .55$) and indoor tanning (39.6%; 95% CI, 35.8%–43.5%; $P = .11$) were not statistically significant in the adjusted models. Of the individuals who tanned indoors who had experienced sunburn in the past 12 months, 10.0% (95% CI, 7.1%–13.9%) experienced a sunburn from indoor tanning.

Discussion

These results provide an overview of the latest national data on sun protection behaviors and sunburn among US adults. Shade and sunscreen use were the most prevalent protective behaviors among women; long clothing to the ankles and shade were the most prevalent among men. Use of wide-brimmed hats and long-sleeved shirts was low among men and women. Nearly half of women regularly used sun avoidance strategies (mostly staying in the shade), whereas men more frequently used protective clothing. Future interventions could be designed to account for these differences while taking other social influences, such as fashion trends, into account.¹¹

The findings among sun-sensitive individuals are a unique aspect of this article. Previous publications^{12–14} have focused on non-Hispanic white individuals because of the high rates of skin cancer within that demographic group. However, a focus on sun sensitivity is more informative given the increasing racial and ethnic diversity within the US population. Shade and sunscreen use were the only protective behaviors for which prevalence was higher among sun-sensitive individuals than among all adults. Such differences were not observed for protective clothing, suggesting that the factors that drive clothing choices may be different from those that influence shade and sunscreen use.

Sunburn is common among US adults, especially among younger adults and those with sun-sensitive skin, indicating a need for prevention efforts that target these high-risk groups. However, adults of all ages could benefit from sun safety interventions. For example, approximately 14% of adults 65 years and older experience sunburn each year, which has important public health implications. Older adults grew up with different social norms related to sun exposure (potentially resulting in greater total lifetime sun exposure) and are rarely targeted by sun safety interventions.¹⁵

In addition, sun safety efforts are needed across racial and ethnic groups. For example, approximately 13% of non-Hispanic black individuals, a group generally thought to be at low risk, and nearly 30% of Hispanic individuals (an increasing segment of the US population¹⁶) experienced sunburn. Consistent with previous research findings,¹⁷ acculturation was associated with a higher likelihood of sunburn. Non-Hispanic white individuals are not the only demographic group who could benefit from sun safety support, and a comprehensive approach to skin cancer prevention will necessitate considering the increasing racial and ethnic diversity¹⁸ of the United States and developing messages that are salient to the various demographic groups.

In general, the association between use of sun protection and sunburn prevalence was weak or nonexistent. The small absolute differences in the prevalence of sunburn among those who routinely used sun protection compared with those who did not may be related in part to inconsistencies in the use of these strategies over time and the limited amount of information provided by the survey questions used. The gaps in our understanding about the context in which sunburn occurs point to areas in which future research is warranted to determine how public health efforts can promote and support meaningful and adequate use of sun protection.

Use of sun avoidance strategies (seeking shade or not going in the sun) was associated with a slight reduction in the likelihood of sunburn. Shade allows users to enjoy time outdoors while reducing total UV radiation exposure and providing relief from solar heat. Strategic shade placement in outdoor spaces is an effective way to promote sun safety in communities.¹⁹ Given the benefits of time spent outdoors, complete sun avoidance is not a desired recommendation.³ However, rescheduling outdoor activities to avoid midday exposure when the sun's rays are most intense allows individuals to enjoy time outdoors while minimizing UV radiation exposure. Combining shade use with other sun protection strategies may help to ensure adequate protection when outdoors for extended periods.²⁰

Consistent with a prior report,²¹ sunscreen use was associated with a higher likelihood of sunburn. Compelling findings from previous studies indicate the potential for sunscreen to reduce the risk of melanoma,²² squamous cell carcinoma,^{23–25} and photoaging of the skin²⁶ when used as directed. In real-world settings, sunscreen users might not always follow the directions on the label, apply sufficient amounts, or reapply sunscreen often enough, all of which can reduce the protective benefits.^{27,28} Sunscreen is intended to be used in combination with other forms of sun protection,²⁹ and those relying solely on sunscreen for sun safety may have a false sense of protection²⁷ or may use it on some but not all sun-exposed skin.^{28,30} Research indicates that when sun exposure is intentional, sunscreen use leads to longer duration of exposure.³¹ Those seeking a tanned appearance may use sunscreen in an attempt to develop a tan without burning and, as such, will likely require alternative intervention approaches beyond education alone.

We did not find an association between use of protective clothing and sunburn. The level of UV protection provided by clothing depends on many factors, including the color, material, and weave of the fabric, and the current NHIS data lacked details on clothing type and the amount of skin that was still exposed to the sun. Typical attire worn outdoors in warm weather often leaves some skin exposed to the sun, thus necessitating the use of additional sun protection strategies, such as seeking shade or using sunscreen.

This is the first US study, to our knowledge, to examine the association between use of sunless tanning products and sunburn at the national level. Use of self-applied sunless tanning products was associated with sunburn, a finding that is likely related to increased sun-seeking behaviors and possibly misconceptions about the protection conferred by sunless tanning products. Although some have promoted sunless tanning as a harm reduction strategy,³² this approach does not address underlying social norms that promote excessive UV exposure for appearance reasons and may give a false sense of protection against sun exposure. Findings from a study³³ in Australia suggest that different intervention approaches may be needed for the different types of tanners (eg, those who use sunless tanning products compared with those who seek a suntan outdoors).

Physical activity was also associated with sunburn. This finding may be related to greater total sun exposure among the physically active and the challenges of maintaining adequate sun protection when being active outdoors, although the physical activity measure was not limited to outdoor activity.³⁴ Messages about sun safety and physical activity could encourage individuals to schedule outdoor activities at times when UV radiation from the sun is less intense. Sports and recreation organizations and employers of outdoor workers could also implement a variety of sun-safe policies and provide shade to complement individual-directed sun safety messages.³⁵

Binge drinking was also associated with a higher prevalence of sunburn, a finding that is consistent with previous reports,^{36,37} and may be indicative of the general tendency of risky behaviors to cluster and possibly the social contexts in which sunburn sometimes occurs. More research on the social contexts associated with these behaviors could be informative to future prevention interventions. This finding is also notable given the current US Preventive Services Task Force recommendations for alcohol misuse screening and brief behavioral

counseling interventions,³⁸ as well as recommendations for behavioral counseling on skin cancer prevention for fair-skinned patients aged 10 to 24 years.³⁹ There may be opportunities for clinicians to address both behaviors with patients when appropriate.

Limitations

This study has several limitations. The data are based on self-reported information, which is subject to bias. The large sample size warrants caution when interpreting statistically significant results with small absolute differences among categories. Given the cross-sectional nature of the survey, we cannot make inferences about causality. In addition, we do not know the exact context in which the sun protection behaviors were used or the sunburns occurred and cannot draw conclusions regarding sunburn causation. We also do not know how the sun protection behaviors were used or whether individuals who report regular use of multiple sun protection behaviors typically use those strategies together or use them separately in different contexts.

Conclusions

Sunburn is common among US adults. Use of sun protection is low and not uniformly associated with lower rates of sunburn. The lack of a strong association between sunburn and use of sun protection highlights remaining gaps in our understanding of the contexts that lead to sunburn and points to potential areas for future research. Young, non-Hispanic white individuals may be at greatest risk for sunburn. However, the prevalence of sunburn within other racial and ethnic groups suggests a need to consider sun sensitivity when identifying the target audiences for sun safety interventions. The intervention approaches for those engaging in intentional tanning behaviors (eg, indoor tanning and sunless tanning) will likely need to address the motivations, social norms, and barriers experienced by these groups. Others may benefit from information about how to ensure they are adequately and consistently protected when spending time outdoors. Policy and environmental changes (eg, shade provision) that facilitate sun safety may help to address some of the challenges of individual behavior change and possibly influence social norms over time.

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Key Points

Questions

Among US adults, what is the prevalence of sun protection and sunburn, and what factors are associated with sunburn?

Findings

In this cross-sectional study of 31 162 US adults, the prevalence of sunburn was highest among younger adults, non-Hispanic white individuals, and those with sun-sensitive skin but was also high among groups considered to have low skin cancer risk (eg, black and Hispanic individuals). Sun avoidance behaviors were associated with a lower likelihood and sunscreen use, sunless tanning, aerobic activity, binge drinking, and overweight/obesity with a greater likelihood of sunburn.

Meaning

Although sunburn is more common among certain groups (eg, younger, sun-sensitive, and physically active adults), targeted prevention efforts are needed across all demographic groups.

Table 1

Weighted Unadjusted Percentages of US Adults Who Regularly Use Sun Protection Strategies and Experience Sunburn^a

Variable	Study Participants, No.	Participants, % (95% CI)			Sun-Sensitive Individuals ^b (n = 15 876)
		Total (N = 31 162)	Men (n = 13 932)	Women (n = 17 230)	
Stay in the shade					
Yes	11 660	37.1 (36.3–38.0)	30.7 (29.5–31.9)	43.1 (42.1–44.2)	41.1 (39.9–42.3)
No	17 476	57.4 (56.5–58.3)	65.4 (64.2–66.6)	49.9 (48.9–51.0)	57.2 (56.0–58.4)
Don't go in the sun	1956	5.5 (5.1–5.9)	3.9 (3.5–4.4)	6.9 (6.3–7.6)	1.7 (1.5–2.0)
Use sunscreen with SPF 15					
Yes	9305	31.5 (30.7–32.3)	22.1 (21.2–23.1)	40.2 (39.0–41.3)	42.9 (41.8–44.1)
No	19 990	63.4 (62.6–64.2)	74.3 (73.3–75.3)	53.2 (52.0–54.3)	55.5 (54.3–56.6)
Don't go in the sun	1852	5.2 (4.8–5.6)	3.6 (3.2–4.0)	6.7 (6.1–7.3)	1.6 (1.4–1.9)
Wear long clothing to the ankles					
Yes	9794	28.4 (27.6–29.1)	34.3 (33.2–35.5)	22.9 (22.0–23.7)	28.2 (27.2–29.2)
No	19 460	66.3 (65.5–67.1)	62.2 (61.0–63.4)	70.1 (69.1–71.1)	70.2 (69.1–71.2)
Don't go in the sun	1881	5.3 (4.9–5.8)	3.5 (3.1–4.0)	7.0 (6.4–7.7)	1.7 (1.4–2.0)
Wear a wide-brimmed hat					
Yes	4729	14.2 (13.5–14.8)	14.4 (13.5–15.4)	14.0 (13.2–14.7)	16.0 (15.2–16.9)
No	24 486	80.4 (79.6–81.2)	82.0 (81.0–82.9)	79.0 (77.9–79.9)	82.4 (81.5–83.3)
Don't go in the sun	1919	5.4 (5.0–5.9)	3.7 (3.2–4.1)	7.1 (6.5–7.8)	1.6 (1.3–1.9)
Wear a long-sleeved shirt					
Yes	4390	12.3 (11.7–12.8)	13.2 (12.4–14.0)	11.4 (10.7–12.1)	12.8 (12.1–13.5)
No	24 844	82.4 (81.6–83.1)	83.3 (82.4–84.2)	81.5 (80.5–82.5)	85.6 (84.8–86.3)
Don't go in the sun	1903	5.4 (5.0–5.8)	3.5 (3.1–4.0)	7.1 (6.5–7.8)	1.7 (1.4–2.0)
Sun avoidance ^c					
Yes	13 436	42.0 (41.2–42.9)	34.2 (33.0–35.4)	49.3 (48.3–50.4)	42.3 (41.1–43.4)
No	17 726	58.0 (57.1–58.8)	65.8 (64.6–67.0)	50.7 (49.6–51.7)	57.8 (56.6–58.9)
Protective clothing ^d					
Yes	12 329	38.8 (37.9–39.7)	43.8 (42.5–45.0)	34.0 (33.0–35.1)	38.5 (37.4–39.6)

Variable	Participants, % (95% CI)				
	Study Participants, No.	Total (N = 31 162)	Men (n = 13 932)	Women (n = 17 230)	Sun-Sensitive Individuals ^b (n = 15 876)
No	16 894	61.2 (60.3–62.1)	56.3 (55.0–57.5)	66.0 (64.9–67.0)	61.5 (60.4–62.6)
No. of sunburns					
0	21 336	65.8 (64.9–66.7)	65.2 (63.9–66.5)	66.4 (65.2–67.5)	49.8 (48.6–51.1)
1	4706	16.3 (15.7–16.9)	16.9 (16.0–17.8)	15.7 (15.0–16.5)	22.7 (21.9–23.6)
2	2875	9.9 (9.4–10.4)	9.6 (9.0–10.4)	10.2 (9.6–10.8)	14.7 (13.9–15.6)
3	921	3.4 (3.2–3.7)	3.4 (3.0–3.8)	3.5 (3.1–3.9)	5.6 (5.1–6.2)
4	1324	4.6 (4.3–5.0)	4.9 (4.4–5.5)	4.3 (3.9–4.8)	7.1 (6.5–7.7)

Abbreviation: SPF, sun protection factor.

^aData derived from the National Health Interview Survey, 2015. Those with a personal history of melanoma and those with missing responses to questions about sunburn or sun protection were excluded.

^bSun-sensitive individuals are those whose skin burns when not protected from the sun for 1 hour.

^cSun avoidance was defined as usually or always staying in the shade or not going in the sun.

^dProtective clothing was defined as usually or always wearing 1 or more of the following: wide-brimmed hat, long sleeved shirt, or long clothing to the ankles.

Weighted Unadjusted and Adjusted Estimates of the Percentage of US Adults Who Experienced 1 or More Sunburns in the Past 12 Months Among All Adults and Among Sun-Sensitive Individuals^a

Variable	Study Participants, No.	Unadjusted		Adjusted		Sun-Sensitive Adjusted (n = 15 876) ^b	
		Participants, % (95% CI)	P Value	Participants, % (95% CI)	P Value	Participants, % (95% CI)	P Value
Total	31 162	34.2 (33.3–35.1)	NA	NA	NA	NA	NA
Sex							
Male	13 932	34.8 (33.6–36.1)	.12	36.4 (35.0–37.8)	.64	51.9 (50.0–53.8)	.29
Female	17 230	33.6 (32.5–34.8)		36.8 (35.6–38.1)		50.7 (49.0–52.3)	
Age, y							
18–29	5328	47.2 (45.0–49.4)		51.2 (48.8–53.7)		71.2 (68.2–74.0)	
30–39	5219	44.2 (42.4–45.9)		46.5 (44.5–48.4)		64.1 (61.3–66.8)	
40–49	4852	38.5 (36.6–40.4)	<.001	40.0 (38.1–42.0)	<.001	54.7 (51.8–57.5)	<.001
50–65	8515	29.4 (27.9–30.8)		30.0 (28.4–31.6)		43.0 (40.7–45.4)	
66	7248	12.4 (11.3–13.6)		14.8 (13.2–16.5)		22.0 (19.6–24.7)	
Race/ethnicity							
Hispanic	5200	24.5 (22.8–26.3)		29.7 (27.6–31.9)		43.4 (39.8–47.1)	
Non-Hispanic white	19 562	42.6 (41.4–43.9)	<.001	42.5 (41.2–43.9)	<.001	53.2 (51.7–54.7)	<.001
Non-Hispanic black	4152	9.7 (8.6–10.9)		13.2 (11.6–15.1)		38.0 (31.6–44.9)	
Non-Hispanic other	2072	18.2 (16.1–20.6)		24.7 (21.5–28.3)		41.5 (36.3–46.9)	
Skin's reaction after 2 weeks unprotected in the sun							

Variable	Study Participants, No.	Unadjusted		Adjusted		Sun-Sensitive Adjusted (n = 15 876) ^b	
		Participants, % (95% CI)	P Value	Participants, % (95% CI)	P Value	Participants, % (95% CI)	P Value
Burn repeatedly or freckle	5186	49.4 (47.3–51.4)		43.5 (41.6–45.4)		54.6 (52.5–56.6)	
Mild tan	9328	33.9 (32.4–35.5)		35.4 (34.1–37.6)		49.9 (47.7–52.0)	
Moderate tan	9321	36.1 (34.6–37.5)	<.001	36.1 (34.7–37.6)	<.001	49.9 (47.8–52.1)	<.001
Very dark tan	3788	29.0 (26.9–31.1)		33.2 (31.0–35.5)		55.5 (51.5–59.4)	
Do not go in the sun	2911	9.4 (7.9–11.1)		23.0 (19.0–27.6)		39.2 (31.1–47.9)	
Marital status							
Married or living with partner	15 659	36.2 (35.0–37.3)		37.7 (36.5–38.9)		52.4 (50.9–54.0)	
Divorced or separated	5301	27.1 (25.5–28.8)		35.6 (33.9–37.7)		50.1 (47.4–52.8)	0.02
Widowed	3017	13.2 (11.4–15.1)	<.001	35.0 (31.1–39.1)	.004	52.1 (46.7–57.5)	
Never married	7126	38.3 (36.4–40.3)		34.4 (32.5–36.3)		47.8 (45.0–50.6)	
Foreign-born status							
Born in the United States	25 392	38.0 (36.9–39.0)		38.2 (37.2–39.3)		52.6 (51.2–53.9)	
<10 y in the United States	1112	17.5 (14.5–21.0)	<.001	22.8 (19.1–26.5)	<.001	35.4 (29.0–42.4)	<.001
10 y in the United States	4583	17.8 (16.4–19.2)		29.6 (27.2–32.0)		42.9 (38.9–46.9)	
US region							
Northeast	5142	33.0 (31.2–35.0)		35.2 (33.0–37.3)		51.6 (48.6–54.7)	
Midwest	6583	41.1 (38.7–43.4)		38.8 (36.9–40.7)		54.1 (51.8–56.4)	.01
South	10 654	29.9 (28.4–31.5)	<.001	35.6 (34.1–37.1)	.02	49.3 (47.4–51.3)	
West	8783	35.2 (33.4–37.0)		37.0 (35.2–38.8)		51.0 (48.6–53.4)	

Variable	Study Participants, No.	Unadjusted		Adjusted		Sun-Sensitive Adjusted (n = 15 876) ^b	
		Participants, % (95% CI)	P Value	Participants, % (95% CI)	P Value	Participants, % (95% CI)	P Value
Regularly uses sun avoidance ^c							
Yes	13 436	27.3 (26.1–28.5)	<.001	34.7 (33.2–36.3)	<.001	47.3 (45.3–49.5)	<.001
No	17 726	39.2 (38.1–40.3)		37.7 (36.6–38.8)		53.9 (52.5–55.4)	
Regularly wears protective clothing ^d							
Yes	12 329	30.1 (28.9–31.5)	<.001	36.3 (34.8–37.8)	.55	50.9 (48.8–53.0)	.61
No	16 894	39.2 (38.0–40.4)		36.8 (35.7–38.0)		51.5 (49.9–53.1)	
Regularly uses sunscreen with SPF 15							
Yes	9305	45.2 (43.7–46.7)	<.001	39.5 (38.0–41.0)	<.001	52.2 (50.3–54.0)	.02
No	19 990	30.9 (29.9–32.0)		35.1 (33.9–36.3)		50.7 (49.1–52.2)	
Indoor tanning							
Yes	1037	58.8 (54.8–62.6)	<.001	39.6 (35.8–43.5)	.11	53.2 (47.8–58.6)	.46
No	30 105	33.3 (32.4–34.3)		36.5 (35.5–37.5)		51.2 (49.9–52.5)	
Sunless tanning (self-applied)							
Yes	1517	57.5 (54.0–61.0)	<.001	45.0 (41.5–48.6)	<.001	59.0 (54.5–63.3)	<.001
No	29 638	32.9 (32.0–33.9)		36.1 (35.0–37.1)		50.6 (49.3–51.9)	
Aerobic activity							
No aerobic activity	10 102	23.2 (21.9–24.6)		32.8 (31.1–34.5)		46.1 (43.6–48.7)	
Some aerobic activity	6652	36.1 (34.4–37.8)	<.001	37.9 (36.3–39.6)	<.001	51.5 (49.3–53.7)	<.001
Meets or exceeds recommendations ^e	13 892	40.4 (39.2–41.7)		37.9 (36.7–39.2)		53.6 (51.8–55.4)	

Variable	Study Participants, No.	Unadjusted		Adjusted		Sun-Sensitive Adjusted (n = 15 876) ^b	
		Participants, % (95% CI)	P Value	Participants, % (95% CI)	P Value	Participants, % (95% CI)	P Value
Binge drank in past 30 d ^f							
Yes	4111	53.6 (51.4–55.8)	<.001	45.1 (43.1–47.1)	<.001	57.8 (54.9–60.7)	<.001
No	26 650	31.1 (30.1–32.1)		35.0 (33.9–36.1)		50.0 (48.6–51.5)	
Overweight or obese							
Yes	19 699	34.1 (33.1–35.2)	.37	37.9 (36.7–39.0)	<.001	53.1 (51.6–54.6)	<.001
No	10 675	34.9 (33.4–36.4)		34.4 (33.0–35.9)		48.0 (46.0–50.0)	

Abbreviations: NA, not applicable; SPF, sun protection factor.

^aData are derived from the National Health Interview Survey, 2015. Those with a personal history of melanoma and those with missing responses to questions about sunburn or sun protection were excluded. Educational level and insurance category were also included and were significant in the overall model but not in the model among only sun-sensitive individuals. Sexual orientation, spray-on tanning at a salon, receipt of a skin examination, family history of melanoma, personal history of cancer, and smoking status were included but were not statistically significant in the adjusted models.

^bSun-sensitive individuals are those whose skin burns when not protected from the sun for 1 hour. These are adjusted analyses.

^cSun avoidance was defined as usually or always staying in the shade or not going in the sun.

^dProtective clothing was defined as usually or always wearing one or more of the following: wide-brimmed hat, long sleeved shirt, or long clothing to the ankles.

^eMet or exceeded 150 minutes of moderate-intensity aerobic activity or 75 minutes of vigorous activity (or an equivalent mix of both) each week as recommended in the 2008 Physical Guidelines for Americans (<https://health.gov/paguidelines/>).

^fBinge drinking is defined as 4 or more alcoholic drinks for women or 5 or more drinks for men.